

Notice of Allowability

Application No.

09/833,609

Examiner

Stephen J Stein

Applicant(s)

WEIR ET AL.

Art Unit

1775

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Applicants' Amendment filed in conjunction with an RCE on August 23, 2004.
2. ☒ The allowed claim(s) is/are 1,2,4-8,10-14 and 17-21.
3. ☒ The drawings filed on 03 July 2001 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
 - * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.


THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date 20040927.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.


STEPHEN STEIN
PRIMARY EXAMINER

Art Unit: 1775

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Richard D. Weir on September 27, 2004.

The application has been amended as follows:

IN THE CLAIMS

1. (Currently amended) A [An] method for making an electrical-energy-storage unit comprising [of] components fabricated by the method steps as follow;
 - a) preparing a wet-chemical-prepared calcined composition-modified barium titanate powder derived from a solution of precursors: $\text{Ba}(\text{NO}_3)_2$, $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$, $\text{Nd}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$, $\text{Y}(\text{NO}_3)_3 \cdot 4\text{H}_2\text{O}$, $\text{Mn}(\text{CH}_3\text{COO})_2 \cdot 4\text{H}_2\text{O}$, $\text{ZrO}(\text{NO}_3)_2$, and $[\text{CH}_3\text{CH}(\text{O})\text{COONH}_4]_2\text{Ti}(\text{OH})_2$ in deionized water heated to 80°C , and a separate solution of $(\text{CH}_3)_4\text{NOH}$ made in deionized water and heated to $80^\circ\text{-}85^\circ\text{C}$, then [by] mixing the solutions by pumping the heated ingredient streams simultaneously through a coaxial fluid mixer producing coprecipitated powder, then collecting the coprecipitated powder [is collected] in a down-out vessel and [refluxed] refluxing at a temperature of $90^\circ\text{-}95^\circ\text{C}$ for 12 hours, then [filtered] filtering, washing with deionized-water [washed], [dried] drying, and then [calcined] calcining 1050°C in air; and

- b) fabricating an aluminum oxide (Al_2O_3) coating of 100 Å thickness onto the wet-chemical-prepared calcined composition-modified barium titanate powder, [an aluminum oxide (Al_2O_3) coating of 100 Å thickness was fabricated] with the use of aluminum nitrate nonahydrate precursor applied by wet chemical means, then [calcined] calcining at 1050° C, resulting in a single-coated calcined composition-modified barium titanate powder; and
- c) fabricating onto the alumina-coated composition-modified barium titanate powder, a second uniform coating of 100 Å of calcium magnesium aluminosilicate glass derived [and fabricated] from alcohol-soluble precursors: calcium methoxide or calcium isopropoxide, magnesium methoxide or magnesium ethoxide, aluminum ethoxide or aluminum isopropoxide or aluminum isopropoxide, and tetraethyl orthosilicate are applied by wet chemical means which upon calcining at 500° C results in a double-coated composition-modified barium titanate powder; and
- d) blending, this double-coated composition-modified barium titanate powder with a screen-printing ink containing appropriate plastic resins, surfactants, lubricants, and solvents to provide a suitable rheology for screen printing; and
- e) screen-printing [printed] into interleaved multilayers of alternating offset nickel electrode layers 12 and double-coated calcined composition-modified barium titanate high-relative-permittivity layers 11 with the use of screening inks having the proper rheology for each of the layers; and

- f) [dry] drying and [cut] cutting the screen-printed multilayer components **15** into a specified rectangular area; and
- g) [binder-burnout and sinter] sintering the screen-printed multilayer components **15**, first at a temperature of 350° C for a specified length of time, then at 850° C for a specified length of time, to form closed-pore porous ceramic bodies; and
- h) hot isostatically [press] pressing the closed-pore porous ceramic bodies, at a temperature of 700° C with a specified pressure, into a void-free condition; and
- i) [grind] grinding and [polish] [polishing] each side of the component to expose the alternating offset interleaved nickel electrodes **12**; and
- j) connecting nickel side bars **14** [are connected] to each side of the components **15**, that have the interleaved and alternating offset nickel electrodes **12** exposed, by applying nickel ink with the proper rheology to each side and clamping the combinations together; and
- k) heating the components and side nickel bar combination **14-15** [are then heated at the proper temperature,] 800° C, and time duration of 20 minutes to bond them together; and
- l) wave [solder] soldering each side of the conducting bars; and
- m) assembling the components **15** with the connected nickel side bars **14** [are then assembled] into the first array, utilizing unique tooling and solder-bump technology; and
- n) assembling the first arrays [are then assembled] into the second array; and

- o) assembling the second arrays [are then assembled] into the EESU final assembly.
2. (Currently amended) [An] The method for making the electrical-energy-storage unit as recited in claim 1 wherein [the method of said claim provide] a second coating of glass is provided onto the double-coated composition-modified barium titanate powder being in contact with the nickel electrodes and having an applied working voltage of 3500 V across the parallel electrodes.
3. (Cancelled)
4. (Currently amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein [the method of said claim provide a unique double coating of the composition-modified barium titanate powder and the hot isostatic pressing at the near-minimum-temperature viscous-flow condition of the glass, 700° C,] a dielectric voltage breakdown strength of 5.0×10^6 V/cm was achieved across the electrodes of the components.
5. (Previously presented) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides an ease of manufacturing due to the softening temperature of the calcium magnesium aluminosilicate glass allowing the relatively low hot-isostatic-pressing temperatures of 700° C which in turn [provided] provides a void-free ceramic body.
6. (Previously presented) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides an ease of fabrication due to the softening temperature of the calcium magnesium aluminosilicate glass allowing the

relatively low hot-isostatic-pressing temperatures of 700° C which in turn allows the use of nickel for the conduction-path electrodes rather than expensive platinum, palladium, or palladium-silver alloy.

7. (Currently amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides an ease of fabrication due to the softening temperature of the calcium magnesium aluminosilicate glass allowing the relatively low hot-isostatic-pressing temperatures of 700° C, which feature along with the coating method provided a uniform-thickness shell of the calcium magnesium aluminosilicate glass and in turn provides hot-isostatic-pressed double-coated composition-modified barium titanate high-relative-permittivity layers that [were] are uniform and homogeneous in microstructure.
8. (Currently amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides the double coating of the basis particles of the composition-modified barium titanate powder [reduced] thereby reducing the leakage and aging of this material by an order of magnitude of the specification of this basis material, thus reducing the discharge rate to 0.1% per 30 days.
9. (Cancelled)
10. (Currently amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides a double coating of the composition-modified barium titanate powder, the hot-isostatic-pressing process, the high-density solder-bump packaging, and along with the double-layered array

configuration stored 52,220 W•h of electrical energy in a 2005 inches³ container.

11. (Currently amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides materials used: water-soluble precursors of barium (Ba), calcium (Ca), titanium (Ti), zirconium (Zr), manganese (Mn), yttrium (Y), neodymium (Nd), forming the composition-modified barium titanate powder, and the metals: nickel (Ni), and copper (Cu), which are not explosive, corrosive, or hazardous.
12. (Currently amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides an EESU that is not explosive, corrosive, or hazardous and therefore is a safe product when used in electrical vehicles, which include bicycles, tractors, buses, cars, or any device used for transportation or to perform work.
13. (Currently amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides an EESU which can store electrical energy generated from solar voltaic cells or other alternative sources for residential, commercial, or industrial applications.
14. (Currently amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides an[d] EESU which can store electrical energy from the present utility grid during the night when the demand for electrical power is low and then deliver the electrical energy during the peak power demand times and thus provide an effective power averaging function.

Art Unit: 1775

15. (Canceled)

16. (Canceled)

17. (Currently amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides a double coating of the composition-modified barium titanate powder and a hot-isostatic-pressing process which together [assisted] assists in allowing an applied voltage of 3500 V to a dielectric thickness of $12.76 \times 10^{-6} \text{ m}$ to be achieved.

18. (Currently Amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides a EESU which [was] when fully discharged and recharged, [and] the EESU's initial specifications [was] are not degraded.

19. (Currently Amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides a EESU which can be [was] safely charged to 3500 V and store[d] at least 52.22 kW•h of electrical energy.

20. (Currently Amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides a EESU that has a total capacitance of at least 31 F.

21. (Currently Amended) [An] The method for making the electrical-energy-storage unit as recited in Claim 1 wherein the method [of said claim] provides a EESU that [was] can be rapidly charged without damaging the material or reducing its life.

Art Unit: 1775

Allowable Subject Matter

2. Claims 1, 2, 4-8, 10-14 and 17-21 are allowed over the prior art of record.
3. The following is an examiner's statement of reasons for allowance:

The primary reason for allowance, is applicants' agreement to an examiner's amendment converting the product by process claims to method of making claims. While certain prior art of record, such as US Patent 6,268,054 (Costantino et al.), discloses a dielectric layers for multi-layer ceramic capacitors wherein the dielectric material is made up oxide coated barium titanate particles and US Patent 6,078,494 (Hansen), which discloses a capacitor having a dielectric material made of a calcined powder of doped barium-calcium-zirconium titanate with nickel or nickel alloy electrodes, the prior art of record fails to teach or suggest the claimed steps for making the electrical energy storage unit.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

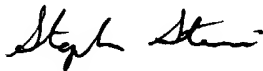
Conclusion

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Stein whose telephone number is 572-272-1544. The examiner can normally be reached on Monday through Friday from 8:30 a.m. to 5:00 p.m. If the attempts to reach the examiner are unsuccessful, the examiner's supervisor, Deborah Jones can be reached by dialing 571-272-1535. The official fax number is 703-872-9306.

Art Unit: 1775

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

September 28, 2004



Stephen J. Stein
Primary Examiner
Art Unit 1775